

Usefulness of Linear Inflation Method NIBP (iNIBP) during Induction of Anesthesia



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Introduction

NIBP (non-invasive blood pressure) is a low invasive, high accuracy parameter which is essential in hemodynamics monitoring. However, many anesthesiologists are unsatisfied with NIBP measurement. Specifically, after induction of general anesthesia, after tracheal intubation, or in situations such as unexpected bleeding, anesthesiologists want to know the blood pressure right away and get frustrated waiting for a measurement result. Every second counts in clinical anesthesia and a small delay of a few seconds is a long time.

New Technology

In conventional NIBP measurement, the cuff is rapidly inflated to a pressure above systolic then gradually deflated while detecting the oscillations in the cuff corresponding to the arterial pulse (step-deflation method).

In a newly developed linear inflation method (iNIBP), non-invasive blood pressure is measured during the cuff inflation stage. If iNIBP does not detect the oscillations during inflation, monitoring automatically switches to step-deflation method.

In one study¹⁾, the linear inflation method completed measurement in 13.0 ± 2.3 seconds as compared to 32.7 ± 13.6 seconds for the step-deflation method. This small reduction of only 20 seconds is important for anesthesiologists.

In our study, we assessed the usefulness of iNIBP in hemodynamically unstable patients undergoing general anesthesia.

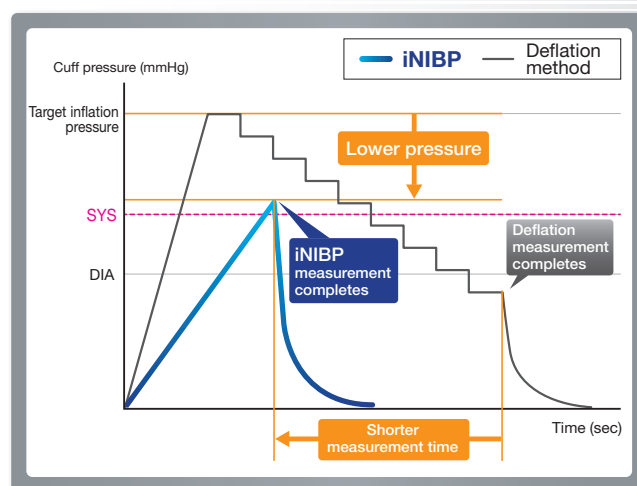


Figure 1. iNIBP method and step deflation method

Methods

Our study included 14 surgery patients receiving tracheal intubation under general anesthesia. Blood pressure was continuously measured with iNIBP from before induction of anesthesia until 1 minute after intubation. We recorded the percentage of successful iNIBP measurements (measurements not switching to step-deflation method) during anesthesia induction and the measurement times of linear inflation method and step-deflation method. We also compared the maximum rate of change in blood pressure for the linear inflation and step-deflation measurements to determine if the rate of blood pressure change had an effect on causing it to switch to step-deflation method.

Results

Out of 326 total NIBP measurements (an average of 23.3 measurements per patient), the linear inflation method successfully measured 91% of the measurements without switching to step-deflation method. Linear inflation method had an average measurement time of 13.7 seconds. When it switched to step-deflation method, the average measurement time was 42.8 seconds. The maximum rate of change in systolic blood pressure was 12.9% (IQR 8-43) when measured with step-deflation method and 31.6% (IQR 22-40) when measured with linear inflation method — not a significant difference. This suggests that change in blood pressure during the anesthesia induction period did not affect switching to the step-deflation method.

iNIBP in ECT

We also evaluated iNIBP in a case of electroconvulsive therapy (ECT). The measurement time was 15 seconds with the linear inflation method when the blood pressure slightly dropped after induction of anesthesia. After the first stimulus, there was a rapid 80 mmHg increase in systolic blood pressure (from 120 to 200 mmHg) and 100% of the measurements were performed with linear inflation method (without switching to step-deflation) with a measurement time of about 15 seconds (Figure 2).

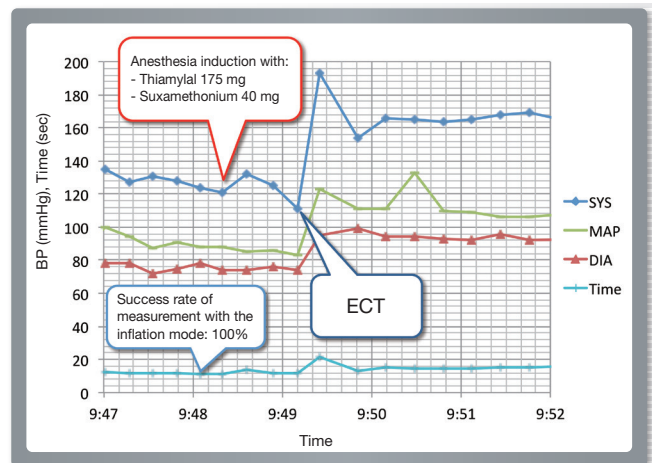


Figure 2. Trend graph for the ECT case

Conclusion

Even during very unstable hemodynamics, the linear inflation method of iNIBP technology can provide NIBP measurement at a frequency close to continuous NIBP measurement. This is useful during perioperative management. iNIBP is a good measurement method for anesthesiologists who want to know the blood pressure as quickly as possible when even 1 second makes a difference.

Reference

- 1) Onodera J, Kotake Y et al. Validation of inflationary non-invasive blood pressure monitoring in adult surgical patients. *J Anesth.* 2011; 25: 127-30.

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